

CLAIMS:

1. A method of processing a nickel-containing layer comprising:
providing a nickel-containing layer overlying a substrate;
introducing a process gas, said process gas comprising a carbonyl gas;
forming plasma from said process gas;
etching said nickel-containing layer by exposing said nickel-containing layer to said plasma, wherein said process gas reacts with said nickel-containing layer.
2. The method according to claim 1, wherein said process gas further comprises a hydrogen halide gas.
3. The method according to claim 2, wherein said hydrogen halide comprises at least one of hydrogen bromide (HBr), hydrogen chloride (HCl) and hydrogen iodide (HI).
4. The method according to claim 2, wherein said carbonyl gas comprises at least one of carbon monoxide (CO) and carbon dioxide (CO₂).
5. The method according to claim 2, wherein said process gas comprises HBr and CO.
6. The method according to claim 2, wherein said process gas comprises HBr and CO₂.
7. The method according to claim 2, wherein said process gas comprises HCl and CO.
8. The method according to claim 2, wherein said process gas comprises HCl and CO₂.
9. The method according to claim 2, wherein said process gas comprises HI and CO.

10. The method according to claim 2, wherein said process gas comprises HI and CO₂.
11. The method according to claim 2, wherein said nickel-containing layer contains nickel and titanium.
12. The method according to claim 1, where said nickel-containing layer contains nickel and iron.
13. The method according to claim 1, wherein said process gas also comprises an inert gas.
14. The method according to claim 13, wherein said inert gas comprises at least one of argon, helium, xenon and nitrogen.
15. The method according to claim 1 wherein said substrate is maintained at a temperature of between 40°C and 100°C.
16. The method according to claim 5, wherein a flowrate of HBr is less than 500 sccm and a flowrate of CO is less than 500 sccm.
17. The method according to claim 6, wherein a flowrate of HBr is less than 500 sccm and a flowrate of CO₂ is less than 500 sccm.
18. The method according to claim 7, wherein a flowrate of HCl is less than 500 sccm and a flowrate of CO is less than 500 sccm.
19. The method according to claim 8, wherein a flowrate of HCl is less than 500 sccm and a flowrate of CO₂ is less than 500 sccm.
20. The method according to claim 9, wherein a flowrate of HI is less than 500 sccm and a flowrate of CO is less than 500 sccm.

21. The method according to claim 10, wherein a flowrate of HI is less than 500 sccm and a flowrate of CO₂ is less than 500 sccm.
22. A plasma processing system comprising:
a process chamber;
a gas injection system configured to inject a process gas within the process chamber, wherein said process gas comprises a carbonyl gas;
a plasma source configured to create plasma from the process gas;
a substrate holder, said substrate holder exposes a substrate comprising a Ni-containing layer to said plasma; and
a controller that controls said plasma processing system.
23. The system according to claim 22, wherein said plasma source comprises an inductive coil.
24. The system according to claim 22, wherein said plasma source comprises a plate electrode.
25. The system according to claim 22, wherein said plasma source comprises an antenna.
26. The system according to claim 22, wherein said plasma source comprises an ECR source.
27. The system according to claim 22, wherein said plasma source comprises a Helicon wave source.
28. The system according to claim 22, wherein said plasma source comprises a surface wave source.
29. The system according to claim 22, wherein said process gas further comprises a hydrogen halide gas.

30. The system according to claim 29, wherein the hydrogen halide comprises at least one of HBr, HCl, and HI.
31. The system according to claim 22, wherein the carbonyl gas comprises at least one of CO and CO₂.
32. The system according to claim 29, wherein the process gas comprises HBr and CO.
33. The system according to claim 29, wherein the process gas comprises HBr and CO₂.
34. The system according to claim 29, wherein the process gas comprises HCl and CO.
35. The system according to claim 29, wherein the process gas comprises HCl and CO₂.
36. The system according to claim 29, wherein the process gas comprises HI and CO.
37. The system according to claim 29, wherein the process gas comprises HI and CO₂.
38. The system according to claim 29, wherein the process gas further includes an inert gas.
39. The system according to claim 38, wherein the inert gas comprises at least one of argon, helium, xenon, and nitrogen.